

REMARKS

The Telephone Interview

The Examiner is thanked for the telephone interview of April 12, 2007 in which she suggested an amendment to the claims. This amendment has been made.

The Amendments

Claim 1 has been amended to specify that the method includes a step of adding a flocculant consisting essentially of about 0.02% to about 3.0% magnesium chloride or an equivalent molar amount of divalent magnesium cation. Support is found, e.g., in the paragraph bridging pages 2 and 3 of the Specification.

Claim 4 has been cancelled as redundant.

Claim 10 has been amended for grammar and clarity.

In addition, new claim 12 has been presented substantially corresponding to previous claim 1. The bottom limit for the aeration time has been specified as “more than 24 hours” instead of “about one day.” Support is found, e.g., in the last full paragraph of page 6. New claim 13 has been presented, dependent on claim 12 and corresponding to as-filed claim 10.

No new matter has been added. Claims 1, 3, and 5-13 are pending herein.

The Rejection Under Section 103 as applied to Claims 1 and 3-11.

Claims 1 and 3-11 were rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over Harmon et al. (US Patent 6235339) in view of Roets (US Patent 4559146) and the admitted prior art in the specification at page 5, lines 6-10, and further in view of Kaczmarek et al. (US Patent 4983297), Fullerton et al. (US Patent 4085041) and Othmer (US Patent 3772187). The Office Action states:

Harmon et al. teach that using magnesium chloride instead of the prior art usage of iron chloride is beneficial. (See col. 4, lines 28-41). Harmon et al. teach treating organic waste streams containing animal fat, blood, tissue, etc. The amount of magnesium chloride: 0.5-5.0% by vol. The patent does not teach aeration. It does teach the magnesium chloride-dissolved air flotation process and the removal of the flocculated material. See col. 3, lines 60-67. The patent also teaches reducing the BOD to less than about 750 ppm. See claim 5.

Roets teaches chemically treating proteinaceous waste water, and then aeration of the waste water. Foam formed is removed during the aeration. See the claims that describe the steps. In this regard, Fullerton et al. teach at col. 2, lines 1-10, that oxygen aeration produces foam that is typically undesirable, which rises to the top and is removed.

The specification discloses that the aeration is performed as is known in the art. The prior art listed therein is said to accomplish the aeration. Othmer teaches coagulating and flocculating waste first before aeration, and then using a Venturi system for the aeration (col. 2, line 4, col. 4, lines 48-50) to reduce BOD (line 56). As for the time for aeration, lines 15-25 (col. 4) teaches some of the parameters determine this. However, aeration time will depend on the degree of reduction of BOD required in the effluent and the nature of the BOD. See also col. 10, lines 42-44. Kaczmarek et al., drawn to waste water, is used here only to show that aerobic waste treatment also is used because the method decreases BOD. See col. 4, lines 46-49. With regard to claim 10, note that Harmon teaches treatment with the oxidizing agent "may be necessary if any color or residual material remains in the fluid fraction". Therefore to eliminate such a step would have been obvious based on Harmon's teaching alone.

It would have been obvious to combine the chemical treatment of proteinaceous wastes of Harmon et al. with an aeration step as shown by Roets, which is also drawn to the same endeavor, and uses iron chloride instead of magnesium chloride, which is followed thereafter by aeration. Since Kaczmarek et al. teach that aeration also reduces BOD in waste treatment, then such disclosure provides the motivation to combine Harmon et al.'s magnesium chloride treatment to reduce BOD with aeration to reduce BOD, in the same manner as Roet, i.e. chemical treatment followed by aeration. In doing so, it would naturally flow from prior art teachings that the BOD would have been reduced to the same extent. See *American Infra-Red Radiant Co. v Lambert Indus., Inc.*, 360 F.2d 977, 986 [149 USPQ 722 (CCPA 1958)], (8th Cir.) (quoting *Application of Libby*, 255 F.2d 412 [118 USPQ 194 (CCPA 1958)], CERT. DENIED, 385 U.S. 920 [151 USPQ 757](1966)). It would also have been obvious to remove any foam formation for the reasons shown by Fullerton et al. and Roets. To use any aeration system, including the Venturi system as shown by

Othmer would have been obvious, since no unobviousness in this regard has been established herein.

The amendment to claim 1, suggested by the Examiner, should overcome this rejection with respect to claims 1, 3, and 5-11. The Harmon et al. reference specifies that an aluminum salt is added in conjunction with the MgCl₂ flocculant. See, e.g., col. 2, lines 42-48, and col. 2, lines 69-67, and claims 1 and 4. Note that the amount of magnesium salt is described at col. 2, lines 46-48 as “an amount effective to induce flocculation of organic material when used in conjunction with the other materials.” Specifying that the flocculant consists essentially of the MgCl₂ or other divalent magnesium cation removes Harmon et al. as a reference and overcomes the rejection.

The Rejection Under Section 103 as applied to Claims 12 and 13.

Claim 12 is a newly-added independent claim that contains all the limitations of previous claim 1, except that a beginning aeration time of more than 24 hours has been specified instead of a beginning aeration time of about one day. Claim 13 specifies that no oxidizing agents are present.

It is noted that none of the references disclose or suggest a treatment time longer than 24 hours as presently claimed herein, much less as long as seven days. Thus, it is submitted that no *prima facie* case of obviousness has been made out, since this element of the claims is not taught in any of the references.

Harmon et al. does not teach aeration at all, and teaches that after flocculation the supernatant liquid typically contains “about 800 ppm BOD or less” (col. 3, last paragraph and col. 4, first paragraph). To get the BOD and COD levels lower, sodium hypochlorite or hydrogen peroxide have to be used (col. 4, second paragraph). Note that claim 10 hereof specifies that sodium hypochlorite and hydrogen peroxide are not added to the waste stream.

Roets also does not specify an aeration time, nor BODs as high as those dealt with herein. Nor does it provide any guidance regarding how much time would be required to achieve BOD reductions as claimed herein.

Fullerton et al. teaches an aeration time of about 7-1/2 hours (Example 4), and less time in the other examples.

Othmer, at col. 10, lines 42-44, teaches an aeration time between 30 minutes to several hours, and in claim 8, from 10 minutes to five hours, depending on whether coagulating and deflocculating agents have been used. In any event, even if Othmer taught that aeration time depends on the degree of reduction of BOD required in the effluent, such a teaching would need to be interpreted to be within the limits of the times disclosed in Othmer, i.e., 10 minutes to five hours.

Although Kaczmarek in Table III specifies a retention time of one day in the aerobic treatment zone, it does not teach a longer retention time. Kaczmarek is a completely different process than that claimed herein because it uses an anaerobic biological treatment and then an aerobic biological treatment in which microorganisms are added to the material. Thus, the aeration time taught by Kaczmarek for this very different process would not be assumed by one skilled in the art to be applicable to the present process.

Contrary to the statement in the present Office Action, the Specification hereof **does not** disclose that the “aeration is performed as is known in the art” with respect to deciding on the time period for the aeration. What the Specification actually teaches is that, “The time of aeration depends on the beginning BOD and COD levels of the effluent to be treated and the final levels. This can be determined without undue experimentation.” (Page 5, lines 8-10). As also discussed below, the key piece of information, **taught for the first time herein**, is that when magnesium is used instead of ferric chloride, greater reduction in BOD can be achieved in a shorter period of aeration time. Only when one skilled in the art has this piece of information can he/she

determine the time of aeration that is needed “without undue experimentation.” This key piece of information is not present in the prior art, and thus no *prima facie* case of obviousness has been made out.

The office action responded to Applicants' arguments for the patentability of previous claim 1 as follows:

Response to Arguments

Applicant's arguments filed 3/14 & 3/15/07 have been fully considered but they are not persuasive.

At pages 6-7, applicant has traversed the rejection in essence, by taking the position that the combination can only have been made based on hindsight reasoning. In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

Applicants' argument was that despite the fact that the specification states that aeration time can be determined by one skilled in the art without undue experimentation, this is only true in light of Applicants' new teachings in the specification that MgCl₂ is much more efficient than FeCl₃ in reducing BOD. This statement cannot be taken out of context and interpreted as though it said: “The time of aeration depends on the beginning BOD and COD levels of the effluent to be treated and the desired final levels. This can be determined based only on prior art teachings and not on the new teachings herein without undue experimentation.”

Only when one skilled in the art has the critical piece of information--supplied in the present specification and not in the prior art--that MgCl₂ is much more efficient than FeCl₃ in reducing BOD--can he/she, without undue experimentation, design a waste water treatment method as claimed herein.

Applicants have discovered that the presence of the divalent magnesium reduces the aeration time that would otherwise be required. This is not disclosed in the prior art. No reference discloses an aeration time longer than one day. The present claims specify an aeration time of more than 24 hours. The efficiency of magnesium is in fact “knowledge gleaned only from the applicant's disclosure,” the use of which the *McLaughlin* case characterizes as impermissible hindsight reconstruction.

It is noted as well that in the *McLaughlin* case, a number of claims were allowed based on objective evidence of nonobviousness. Similarly, in the present case, Applicants have provided evidence that the use of divalent magnesium coupled with aeration times of more than 24 hours gives rise to improved reduction in BOD. This is an unexpected improvement. MPEP § 716.02 makes it clear that marked differences in properties that are differences in kind, not merely differences in degree, show nonobviousness. In the present instance, it has been shown (see last full paragraph on page 6) that in 24 hours, using FeCl₃, BOD was reduced from 550 to 500 ppm, a 9% reduction; while in the same period of time using MgCl₂, BOD was reduced from 750 to under 400 ppm, a more than 46.7% reduction. This represents a difference in kind rather than a mere difference in degree. Not only is the absolute value of the BOD achieved in 24 hours less using MgCl₂, but the percent reduction is more than five-fold greater using MgCl₂. Using MgCl₂ for longer than 24 hours results in even greater BOD reductions. For example, after 72 hours using MgCl₂, a BOD of 200 is achieved, while in the same period of time using FeCl₃, the BOD is still over 400. The efficiency of the process claimed in claim 12 is an unexpected improvement that makes the invention nonobvious.

The Office Action continues:

A review of the references applied show the following

- ❖ Roets teaches clarifying proteinaceous waste water with chemical treatment (FeCl₃) and aeration.
- ❖ Harmon et al. teaches the benefits of using MgCl₂ instead of FeCl₃ and the benefits of substituting one for the other in the reduction of BOD.
- ❖ Therefore, to replace FeCl₃ with MgCl₃ would have been *prima facie* obvious in Roets.

- ❖ Kaczmarek et al. is drawn to waste water treating with aeration and teaches reduction of BOD with this method. One embodiment shows aeration for a day.
- ❖ Othmer teaches an aeration time from 30 minutes to several hours.
- ❖ Othmer teaches that the aeration time depends on whether coagulating and deflocculating agents were used.
- ❖ The specification discloses that "The time of aeration depends on the beginning BOD and COD levels of the effluent to be treated and the desired final levels. This can be determined without undue experimentation." (Page 5, specification).
- ❖ Thus aeration time depends on the nature of the BOD, the BOD levels in the effluent to start with and the final levels desired, and whether coagulating and deflocculating agents were used. And all of these factors can be used to determine aeration time, without undue experimentation.

Therefore, when Harmon et al. is combined with references that teach chemical treatment with iron chloride and aeration, and the iron chloride is substituted with magnesium chloride, and the aeration time calculated based on all the factors above, without undue experimentation, then the aeration time would be obvious. Also, it is well settled that a patent cannot be properly granted for [an invention] which would flow naturally from the teaching of the prior art. *American Infra-Red Radiant Co. v Lambert Indus., Inc.*, 360 F.2d 977, 986 [149 USPQ 722 (CCPA 1958)], (8th Cir.) (quoting *Application of Libby*, 255 F.2d 412 [118 USPQ 194 (CCPA 1958)], CERT. DENIED, 385 U.S. 920 [151 USPQ 757](1966). Applicant's remark that aerating the waste stream for a time of about one to seven days provides a BOD level that is reduced more when MgCl₂ is used would have resulted by following the teachings of the applied patents.

Even if one skilled in the art might have used MgCl₂ instead of FeCl₃ based on the teachings of the combined Harmon et al. and Roets references; one skilled in the art would not have known about the efficiencies that are achieved by making this substitution in combination with aeration for more than 24 hours. One skilled in the art would have no motivation to make the claimed combination of steps. The motivation is supplied by the teachings of Applicant's specification, not by the prior art. Contrary to the statements in the Office Action, the claimed process does not "flow naturally from the teaching of the prior art." Only in impermissible hindsight, using Applicant's own novel teachings, could one arrive at the claimed process.

To assert that Applicant's claimed process is somehow inherent in or "flows naturally from the teachings of" the prior art and is therefore obvious, is to fly in the face

of the large body of case law that holds that a *prima facie* case of obviousness can be rebutted by a showing of an unexpected improvement. MPEP § 716.02(a): "A greater than expected result is an evidentiary factor pertinent to the legal conclusion of obviousness... of the claims at issue." *In re Corkill*, 711 F.2d 1496, 226 USPQ 1005 (Fed. Cir. 1985). *Merck & Co. Inc. v. Biocraft Laboratories Inc.*, 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir.), cert. denied, 493 U.S. 975 (1989). Evidence of unobvious or unexpected advantageous properties, such as superiority in a property the claimed compound shares with the prior art, can rebut *prima facie* obviousness. "Evidence that a compound is unexpectedly superior in one of a spectrum of common properties . . . can be enough to rebut a *prima facie* case of obviousness." No set number of examples of superiority is required. *In re Chupp*, 816 F.2d 643, 646, 2 USPQ2d 1437, 1439 (Fed. Cir. 1987) (Evidence showing that the claimed herbicidal compound was more effective than the closest prior art compound in controlling quackgrass and yellow nut-sedge weeds in corn and soybean crops was sufficient to overcome the rejection under 35 U.S.C. 103, even though the specification indicated the claimed compound was an average performer on crops other than corn and soybean.). See also *Ex parte A*, 17 USPQ2d 1716 (Bd. Pat. App. & Inter. 1990) (unexpected superior therapeutic activity of claimed compound against anaerobic bacteria was sufficient to rebut *prima facie* obviousness even though there was no evidence that the compound was effective against all bacteria). Presence of a property not possessed by the prior art is evidence of nonobviousness. *In re Papesch*, 315 F.2d 381, 137 USPQ 43 (CCPA 1963) (rejection of claims to compound structurally similar to the prior art compound was reversed because claimed compound unexpectedly possessed anti-inflammatory properties not possessed by the prior art compound); *Ex parte Thumm*, 132 USPQ 66 (Bd. App. 1961) (Appellant showed that the claimed range of ethylene diamine was effective for the purpose of producing "regenerated cellulose consisting substantially entirely of skin" whereas the prior art warned "this compound has 'practically no effect.'").

The Office Action continues:

As for applicant's statements regarding the addition of the oxidizing agent at page 7, as pointed out above, the addition is not necessary unless

removal of color or residual material is necessary. Therefore, the addition of peroxide or hypochlorite is optional.

The present Specification does **not** teach that the addition of peroxide or hypochlorite is optional. It teaches that this is **not necessary** when magnesium is used with aeration, instead of ferric chloride. It is the ferric chloride that causes the color. The Specification hereof states at page 2, lines 6-8, "Although ferric chloride is efficient in removing organic solids, it destroys most nutritional value of the isolated solids and **discolors** the fat within the solids." [Emphasis added.] At page 3, lines 22-25, the Specification states, "For comparison, aeration for 24 hours or greater with magnesium enriched effluent is more efficient in reducing BOD than aeration with ferric chloride for the same time span. Aeration with magnesium obviates the need for oxidizing agents such as sodium hypochlorite or hydrogen peroxide."

Harmon et al. teaches that oxidizing agents are not necessary unless removal of color or residual material is necessary. The "residual material" is not defined. Presumably "residual material" refers to ferric chloride since the present Specification clearly teaches that the use of magnesium obviates the need for oxidizing agents.

The Specification at page 6, lines 8-13, further underlines that in this process, oxidizing agents, rather than being "optional," are **not necessary**:

To lower BOD and COD in the effluent after removal of flocculated material, U.S. Pat. No. 6,235,339 reports adding oxidizing agents, such as 5.25% sodium hypochlorite solution or 3.0% hydrogen peroxide solution. In the present invention, extended aeration, for a time period of one day to seven days and at a rate sufficient to maintain dissolved oxygen levels from about 1 to about 8 ppm, of the magnesium enriched effluent reduces BOD levels to well within acceptable ranges for forwarding the liquid stream on to municipal plants.

Although it is not considered necessary for patentability, new claim 13 has been added to specify that no oxidation agents are required.

As for the discussion of the inapplicability of the Kaczmarek, which is disagreed with, Kaczmarek states that "Any conventional aerobic waste

water treatment method for decreasing the Biological Oxygen Demand (B.O.D.) level may be used", thus refuting applicant's position. As for the remaining references, applicant has argued each reference in isolation and has extended the argument to reference teachings that were not relied upon. For instance applicant states that Roets does not teach magnesium as its chemical for the chemical treatment. Magnesium is shown by Harmon, and Roets was relied on to show the pattern and advantage of using aeration as a follow-up after chemical treatment.

It is submitted that Kaczmarek is not applicable is prior art because it should be deemed non-analogous art.

In support of the fact that Kaczmarek is non-analogous art, it is submitted, as previously argued, that Kaczmarek teaches a completely different process than that claimed herein because it uses an anaerobic biological treatment and then an aerobic biological treatment in which microorganisms are added to the material. See, e.g., claim 1. The cited language in the reference reads as follows:

The waste water stream **26** is introduced into aerobic treatment zone **4**. Any conventional aerobic waste water treatment method for decreasing the Biological Oxygen Demand (B.O.D.) level may be used. The waste water stream **26**, after appropriate pH adjustment, is contacted with a biomass of aerobic microorganisms in the presence of a molecular oxygen-containing gas, which may be air or other oxygen-containing gas. Aeration or oxygenation may be carried out by any known method. (col. 4, lines 46-54.)

It is clear from this language that when the patent refers to "aerobic waste water treatment," it refers to processes using *added* aerobic microorganisms, **not to processes using simple aeration**. Even if, as the Patent Office previously argued, fermentation plant effluents might contain microbes, this does not make the Kaczmarek et al. process using added aerobic microbes relevant to the present process which uses simple aeration. An "aerobic" treatment time" as disclosed in Kaczmarek et al. of one day is thus **not equivalent** to an aeration treatment time as claimed herein of one day. Nevertheless, to expedite prosecution, new claim 12 specifies an aeration time of **more than** 24 hours.

Conclusion

None of the references in combination or alone, teaches or suggests addition of a flocculant “consisting essentially of” magnesium chloride or divalent magnesium as specified in claims 1, 3, and 5-11. With respect to claims 12 and 13, no reference in combination or alone teaches an aeration time of more than 24 hours. It has been shown that the specification does **not** teach that the aeration time can be determined without undue experimentation in light only of the cited references. The teachings of the present Specification must also be known before the aeration time can be determined “without undue experimentation.” Thus, it is submitted the claims are not obvious in view of the references.

This application appearing to be in condition for allowance, withdrawal of the rejections and passage of this application to issuance is respectfully requested. It is believed no fee is due with this response, however if this is incorrect, please deduct any fees due amount and any amount required for any further extension of time necessary from deposit account 07-1969.

Respectfully Submitted,

/ewinner/

Ellen P. Winner
Reg. No. 28,547

Greenlee, Winner & Sullivan, P.C.
4875 Pearl East Circle, Suite 200
Boulder, CO 80301
Phone: (303) 499-8080 Fax: (303) 499-8089
Email: winner@greenwin.com
Attorney Docket No.: 32-02
bmk: June 20, 1007